CLAIMS

1. A surface profiling apparatus for providing surface profile information for a sample surface, the surface profiling apparatus comprising:

support means for supporting a sample having a non-planar sample surface;

light directing means for directing light from a broadband light source to an interference zone along first and second light paths, the first light path including the non-planar sample surface and the second light path including a non-planar reference surface, wherein the light directing means comprises shaping means operable i) to shape the beam of light directed along the second light path to form a non-uniform reference light beam which is incident on the non-planar reference surface, wherein a wavefront of the reference non-uniform light beam substantially matches the non-planar reference surface, and ii) to shape the beam of light travelling along the first light path to form a non-uniform sample light beam which is incident on the sample surface, wherein the non-uniform sample light beam has a beam profile which substantially matches the beam profile of the non-uniform reference light beam;

moving means for causing relative movement between the sample surface and the non-uniform sample light beam; and

compensating means for compensating for a difference between the path lengths of the first and second light paths caused by relative movement between the sample surface and the sample light beam so that light from portions of the sample surface which substantially coincide with a wavefront of the sample light beam and light from corresponding portions of

the reference surface produce an interference pattern in the interference zone.

2. A surface profiling apparatus according to claim 1, wherein the light directing means comprises a common path interferometer.

3. A surface profiling apparatus according to claim 1 or 2, wherein the common path interferometer comprises a Fizeau interferometer.

4. A surface profiling apparatus according to any preceding claim, wherein said difference between the path lengths of the first and second paths is an air path.

5. A surface profiling apparatus according to claim 1, wherein the light directing means comprises a first converging lens operable to produce a non-uniform reference light beam having part-spherical wavefronts with a common centre, and a second converging lens operable to produce a non-uniform sample light beam having part-spherical wavefronts with a common centre.

6. A surface profiling apparatus according to any preceding claim, wherein the light directing means comprises a meniscus lens which includes the non-planar reference surface.

7. A surface profiling apparatus according to claim 6, wherein the reference surface of the meniscus lens is separated from the sample surface by an air gap.

8. A surface profiling apparatus according to any preceding claim, wherein the light directing means

comprises a first interferometer, and the compensating means comprises a second interferometer coupled to the first interferometer, and

wherein the second interferometer comprises means for varying the path difference associated with the second interferometer to be equal with the path difference associated with the first interferometer.

9. A surface profiling apparatus according to claim 8, wherein the second interferometer comprises a Michelson interferometer.

10. A surface profiling apparatus according to claim 8, wherein the second interferometer comprises a Fizeau interferometer.

11. A surface profiling apparatus according to any preceding claim, further comprising a detector for detecting the interference pattern in the interference zone.

12. A surface profiling apparatus according to claim 11, wherein the detector comprises a CCD array detector.

13. A surface profiling apparatus according to claim 11 or 12, further comprising means for controlling the moving means and the compensating means in response to the interference pattern detected by the detector.

14. A surface profiling apparatus according to any preceding claim, further comprising the broadband light source.

15. A surface profiling apparatus according to claim

14, wherein the broadband light source comprises a superluminescent diode.

16. A surface profiling apparatus according to claim 14 or 15, wherein the broadband light source is operable to produce light having a FWHM spectral width in the range of 2nm to 50nm.

17. A surface profiling apparatus according to claim 14, further comprising a bandpass filter having a bandwidth in the range of 2nm to 50nm for filtering light produced by the broadband light source.

18. A surface profiling apparatus for providing surface profile information for a sample surface, the surface profiling apparatus comprising:

a support operable to support a sample having a sample surface;

an optical system operable to direct light from a broadband light source to an interference zone along first and second light paths, the first light path including the sample surface and the second light path including a reference surface, wherein the optical system is operable to shape the beam of light travelling along the first light path to form a sample light beam which is incident on the sample surface, wherein the sample light beam has wavefronts which vary along the direction of propagation;

an actuator operable to cause relative movement between the sample surface and the sample light beam; and

a compensator operable to compensate for a difference between the path lengths of the first and second light paths caused by a relative movement between the sample surface and the sample light beam

so that light from portions of the sample surface which substantially coincide with a wavefront of the sample light beam and light from corresponding portions of the reference surface produce an interference pattern in the interference zone.

19. A method of providing surface profile information for a sample surface, the method comprising the steps of:

directing light from a broadband light source to an interference zone along first and second light paths, the first light path including the sample surface and the second light path including a reference surface, wherein the beam of light directed along the second light path is shaped to form a non-uniform reference light beam which is incident on the non-planar reference surface, with a wavefront of the reference non-uniform light beam substantially matching the non-planar reference surface, and wherein the beam of light travelling along the first light path is shaped to form a non-uniform sample light beam which is incident on the sample surface, wherein the non-uniform sample light beam substantially matches the non-uniform reference light beam;

causing relative movement between the sample surface and the sample non-uniform light beam; and

compensating for a difference between the path lengths of the first and second light paths caused by relative movement between the sample surface and the sample light beam so that light from portions of the sample surface which substantially coincide with a wavefront of the sample light beam and light from corresponding portions of the reference surface produce an interference pattern in the interference zone.